

5 October 1966

Material Test Procedure 2-2-513*
Aberdeen Proving Ground

U. S. ARMY TEST AND EVALUATION COMMAND
COMMON ENGINEERING TEST PROCEDURE

FOREIGN VEHICLES

1. OBJECTIVE

The objective of this MTP is to prescribe procedures for the testing and evaluation of foreign vehicles, both friendly and enemy.

2. BACKGROUND

Examination of the ordnance material of other nations has both immediate and long range advantages. The greatest return occurs in time of war, when careful analysis of the enemy's equipment can lead to effective counter-measures and improvement of defense. The testing of all foreign ordnance, friendly or enemy, can be beneficial to the extent that new concepts in design can be utilized when proven effective.

3. REQUIRED EQUIPMENT

The equipment and material required to perform the procedures of this MTP will be listed in the individual material test procedure.

4. REFERENCES

- A. MTP 2-2-500 Vehicle Characteristics
- B. MTP 2-2-501 Amphibious Vehicle Characteristics
- C. MTP 2-2-506 Durability Testing of Wheeled Vehicles
- D. MTP 2-2-507 Durability Testing of Tracked Vehicles
- E. MTP 2-2-508 Safety Evaluation (Automotive)
- F. MTP 2-2-601 Electrical Systems (Automotive)
- G. MTP 2-2-602 Acceleration; Maximum and Minimum Speeds
- H. MTP 2-2-603 Vehicle Fuel Consumption
- I. MTP 2-2-604 Drawbar Pull
- J. MTP 2-2-605 Towing Resistance
- K. MTP 2-2-607 Engine Cooling System (Vehicle)
- L. MTP 2-2-608 Braking
- M. MTP 2-2-609 Steering
- N. MTP 2-2-610 Gradeability & Side Slope Performance Mobility
- O. MTP 2-2-611 Standard Obstacles
- P. MTP 2-2-612 Fording
- Q. MTP 2-2-613 Broadband Radio Interference for Vehicles and Electrical Equipment - Noncommunication
- R. MTP 2-2-614 Toxic Fumes
- S. MTP 2-2-616 Night Performance

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U.	MTP 2-2-618	<u>Vehicle Vulnerability to Nuclear Weapons Attack</u>
V.	MTP 2-2-619	<u>Off Road Vehicle Mobility Test</u>
W.	MTP 2-2-700	<u>Laboratory Tests of Reciprocating Internal Combustion Engines</u>
X.	MTP 2-2-702	<u>Effects of Altitude on Automotive Engines</u>
Y.	MTP 2-2-703	<u>Laboratory Tests of Power Train Components</u>
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AA.	MTP 2-2-705	<u>Tracks and Suspension Tests</u>
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AC.	MTP 2-2-720	<u>Laboratory Tests of Gas Turbine Engines</u>
AD.	MTP 2-2-800	<u>Center of Gravity</u>
AE.	MTP 3-2-500	<u>Weapon Characteristics</u>
AF.	MTP 3-2-506	<u>Self-Propelled Artillery</u>
AG.	MTP 3-2-600	<u>Recoil and Equilibrator</u>
AH.	MTP 3-2-601	<u>Vertical Target Accuracy, Dispersion and Time of Flight</u>
AI.	MTP 3-2-602	<u>Stabilization Systems</u>
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AK.	MTP 3-2-604	<u>Boresight Retention</u>
AL.	MTP 3-2-605	<u>Accuracy Firing for Vehicular Mounted Weapons</u>
AM.	MTP 3-2-709	<u>Field Artillery Fire Control Sights</u>
AN.	MTP 3-2-801	<u>Measurement of Internal Diameters of Cannon</u>
AO.	MTP 3-2-802	<u>Measurement of Cannon</u>
AP.	MTP 3-2-807	<u>Material Testing - Nondestructive Examination</u>
AQ.	MTP 3-2-810	<u>Weapon Pressure Measurement</u>
AR.	MTP 3-2-812	<u>Field of Vision - Vehicles</u>
AS.	MTP 3-2-813	<u>Field of Fire</u>
AT.	MTP 3-2-815	<u>Recoil Motion Measurement</u>
AU.	MTP 3-2-816	<u>Hop Firing</u>
AV.	MTP 3-2-817	<u>Jump Firing</u>
AW.	MTP 4-2-802	<u>Measurement of Projectile Seating</u>
AX.	MTP 4-2-805	<u>Projectile Velocity, Time of Flight and Ballistic Coefficient</u>
AY.	MTP 10-2-500	<u>Physical Characteristics</u>

5. SCOPE

5.1 SUMMARY

~~This MTP~~ ^{THE PROCEDURES} lists the basic vehicle and armament tests to be performed on foreign vehicles. The procedures are listed in an order of increasing severity as regards possible deterioration of the equipment under test. Tests, as applicable, shall be performed in the order they are listed.

NOTE: The listing given is based upon the following assumptions:

- a. The vehicle under test shall be examined for both automotive and armament characteristics without special emphasis being placed on either one.

- b. Only one test item is available.

Should a specific characteristic of the test item warrant testing to the exclusion of other less severe tests, the appropriate test(s) shall be performed without regard to the severity listing, i.e. laboratory tests of vehicle engines to be performed prior to other automotive tests.

5.2 LIMITATIONS

The scope of tests may be limited by lack of spare parts, ammunition, suitable fuel, lubricant, special tools and components. Further problems may be encountered when technical literature pertaining to maintenance and service requirements is not available.

NOTE: Where possible the missing item or material shall be replaced with comparable alternate U. S. Material to permit the evaluation to be completed.

6. PROCEDURES

6.1 PREPARATION FOR TEST

Not applicable

6.2 TEST CONDUCT

The following procedures shall be conducted, as applicable, in the order they are listed unless otherwise directed.

6.2.1 Vehicle Characteristics

A listing of the test vehicle characteristics such as type, major components, armament, fire control equipment and systems shall be compiled as described in MTP 2-2-500.

6.2.2 Weapon Characteristics

A listing of the test vehicle's weapon characteristics as to type, mount, operation, accessories, firing performance, fire control systems, elevation, traverse, range and accuracy shall be compiled as described in MTP 3-2-500.

6.2.3 Electrical Systems (Automotive)

Automotive electrical systems tests, to determine the test vehicle's electrical requirements and capabilities, shall be conducted as described in MTP 2-2-601.

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6.2.4 Field of Fire

Field of fire tests, to determine the restrictions which define or modify the field of fire of the test vehicle mounted weapons, shall be conducted as described in MTP 3-2-813.

6.2.5 Examination of Cannon

Cannon under test shall be subject to the procedures of MTP 3-2-801, MTP 3-2-802, and MTP 3-2-807 to determine the cannons internal and external dimensions and the characteristics of the cannon material.

6.2.6 Safety Evaluation

The tests to determine the safety of the test vehicle and components shall be conducted as described in MTP 2-2-508

Included in safety evaluation are the following procedures:

- a. Brake measurements as described in MTP 2-2-608
- b. Center of gravity measurements as described in MTP 2-2-800
- c. Steering checks as described in MTP 2-2-609
- d. Toxic fumes measurements as described in MTP 2-2-614

6.2.7 Acceleration; Maximum and Minimum Speeds

Tests to determine the test vehicle's full throttle acceleration, minimum speed and maximum speed in all gear or automatic drive ranges shall be conducted as described in MTP 2-2-602.

6.2.8 Fuel Consumption

Vehicle fuel consumption tests under varying loads and road conditions shall be conducted as described in MTP 2-2-603.

6.2.9 Drawbar Pull

Vehicle drawbar pull ability tests on hard roads and adverse soils, and in water, for amphibious vehicles, shall be conducted as described in MTP 2-2-604.

6.2.10 Towing Resistance

Tests to determine the power losses developed between vehicle transmission and the ground at discrete points of the test vehicle speed range using the vehicle's towing resistance, shall be conducted as described in MTP 2-2-605.

6.2.11 Off-Road Mobility Test

A determination of the test vehicle's ability to operate in snow and

such "off-road" conditions as swamps, sand dunes, sand slopes, sand or soil, and dry sand, using the techniques of MTP 2-2-604 (Drawbar Pull) shall be conducted as described in MTP 2-2-619.

6.2.12 Gradeability and Side Slope Performance

The ability of test vehicles to operate on grades up to 60° shall be tested as described in MTP 2-2-610

Included in this procedure are the following checks:

- a. Maximum sustained speeds
- b. Engine, transmission and brake performance
- c. Minimum fuel requirements to enable the vehicle to climb the slope.

6.2.13 Standard Obstacles

The ability of the test vehicle to negotiate obstacles such as trenches, vertical walls and loading ramps is determined as described in MTP 2-2-611.

6.2.14 Tires

Tests to determine the effect of temperature, road conditions, distance travelled on the tires, wear resistance and physical characteristics, and the tires run-flat characteristics are conducted as described in MTP 2-2-704.

6.2.15 Traction Devices

Wheeled vehicle accessory equipment, to enable the vehicle to operate over impassable terrain, is tested as described in MTP 2-2-706.

Included in this procedure are the following:

- a. Mobility checks using drawbar pull (MTP 2-2-604) over off road conditions (MTP 2-2-619).
- b. Durability and general mobility checks running cross-country and over hard surface roads.

6.2.16 Tracks and Suspensions

Tracks and suspension tests, to determine their mobility, vulnerability, effectiveness and performance shall be conducted as described in MTP 2-2-705.

Included in this procedure are the following checks:

- a. For tracks:

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- 1) Physical characteristics
- 2) Resistance to towing as described in MTP 2-2-605
- 3) Drawbar pull as described in MTP 2-2-604
- 4) Traction tests on grades as described in MTP 2-2-610
- 5) Endurance tests

b. For suspensions:

- 1) Effect of different obstacles, such as walls and washboard courses
- 2) Effect of extreme temperatures

6.2.17 Amphibious Vehicles

Tests to determine the operating characteristics of amphibious vehicles, when in water, shall be conducted as described in MTP 2-2-501.

Included in this procedure are the following checks:

- a. Maximum water speed
- b. Towline pull as described in MTP 2-2-604
- c. Vehicle steering control
- d. Cooling tests as described in MTP 2-2-607
- e. Fuel consumption tests as described in MTP 2-2-603
- f. Bilge compartment toxic fume level
- g. Bilge pump operability
- h. Water to land mobility
- i. Ability of the vehicle to operate in various sea/river conditions

6.2.18 Gun Control Systems for Vehicle Mounted Weapons

Vehicle gun control system tests, to determine system performance, efficiency, compatibility, utility, flexibility, and simplicity, shall be conducted as described in MTP 3-2-603.

Included in this procedure are the following checks:

- a. Safety evaluation
- b. System characteristics: Electrical, Mechanical
- c. Static tests
- d. Laboratory tests (Electrical)
- e. Field tests

6.2.19 Field Artillery Fire Control Sights

Non-firing tests of fire control systems such as panoramic sights and elevation quadrants, shall be conducted as described in MTP 3-2-709.

6.2.20 Stabilization Systems

Gun stabilization systems shall be tested as described in MTP 3-2-602.

Included in this procedure are the following checks:

- a. Free drop test
- b. Pivot steer test
- c. Performance tests on stabilizer courses
- d. Firing tests

6.2.21 Broadband Radio Interference Tests

Vehicle and vehicle component radio frequency transmissions shall be checked for interference levels as described in MTP 2-2-613.

6.2.22 Boresight Tests

Vehicle weapons shall be boresighted as described in MTP 3-2-604.

6.2.23 Secondary Armament

Tests to determine the functional characteristics of a combat vehicle's secondary armament shall be conducted as described in MTP 2-2-526.

Included in this procedure are the following checks:

- a. Field of fire as described in MTP 3-2-813
- b. Field of vision as described in MTP 3-2-812
- c. Gun control system tests as described in MTP 3-2-603
- d. Firing tests as described in MTP 3-2-605
- e. Road and durability tests

6.2.24 Vehicle Main Gun Firing Tests

The ability of the test vehicle's main armament, and its fire/gun control system to hit its target shall be determined, as applicable, by conducting the tests described in MTP 3-2-506 and MTP 3-2-605.

In preparation for, during, and after pre-conduct testing of MTP 3-2-506 and MTP 3-2-605, the following measurements, as applicable, shall be taken:

- a. Recoil system measurements as described in MTP 3-2-600 using the instrumentation of MTP 3-2-815
- b. Weapon pressure measurements as described in MTP 3-2-810
- c. Hop firing measurements as described in MTP 3-2-816
- d. Jump firing measurements as described in MTP 3-2-817
- e. Vertical target accuracy, dispersion and time of flight as described in MTP 3-2-601
- f. Projectile velocity, time of flight and ballistic coefficient as described in MTP 4-2-805

g. Measurement of projectile seating as described in MTP 4-2-802

6.2.25 Night Performance

The vehicle's ability to operate at night shall be tested as described in MTP 2-2-616. Comparisons shall be made, when applicable, between night time test results and the data obtained during daylight testing. Included in this procedure are the following tests.

- a. Driving tests
- b. Interior illumination evaluation
- c. Night fire control evaluation
- d. Firing tests

6.2.26 Effects of Altitude on Automotive Engines

Altitude effects (air density and temperature) on the test vehicle engine performance shall be determined as described in MTP 2-2-702.

6.2.27 Fording

The fording capability of the test vehicle shall be determined as described in MTP 3-2-612.

6.2.28 Durability Testing

Durability testing to determine ability and performance of the vehicle components and equipment to operate a prescribed number of miles and hours over various types of terrain shall be tested as described in MTP 2-2-506 or MTP 2-2-507, whichever is applicable.

6.2.29 Laboratory Testing of Vehicular Engines

The performance and endurance characteristics of reciprocating internal combustion engines (spark ignition, diesel) and gas turbine engines, under ideal conditions, shall be determined as described in MTP 2-2-700 and MTP 2-2-720.

6.2.30 Laboratory Testing of Power Train Components

The performance and endurance characteristics of the test vehicle's power train components shall be determined as described in MTP 2-2-703.

Included in this procedure are the following checks:

- a. Transmission tests
- b. Cross-drive steering tests

6.2.31 Vehicle Vulnerability Tests

The test vehicle's vulnerability to conventional weapons (shell fragmentation) and nuclear weapons shall be determined as described in MTP 2-2-617 and MTP 2-2-618.

Included in these procedures are the following checks:

- a. Protection against bullet splash
- b. Resistance to shock and blast damage
- c. Resistance to fragment penetration, shaped charge jet, and projectile penetration
- d. Resistance to flame throwers, smoke and gas
- e. Internal protection from nuclear contamination

6.2.32 Material Characteristics

Tests to determine the physical, chemical, structural and electrical characteristics of the vehicle component material shall be conducted as described in MTP 10-2-500.

6.3 TEST DATA

Data shall be recorded and collected as described, when applicable, in the following procedures.

- a. Vehicle Characteristics: MTP 2-2-500
- b. Weapon Characteristics: MTP 3-2-500
- c. Electrical Systems (Automotive): MTP 2-2-601
- d. Field of Fire: MTP 3-2-813
- e. Examination of Cannon as conducted in:
 - 1) MTP 3-2-801
 - 2) MTP 3-2-802
 - 3) MTP 3-2-807
- f. Safety Evaluation: MTP 2-2-508
- g. Acceleration; Maximum and Minimum Speeds: MTP 2-2-602
- h. Fuel Consumption: MTP 2-2-603
- i. Drawbar Pull: MTP 2-2-604
- j. Towing Resistance: MTP 2-2-605
- k. Off Road Mobility Test: MTP 2-2-619
- l. Gradeability and Side Slope Performance: MTP 2-2-610
- m. Standard Obstacles: MTP 2-2-611
- n. Tires: MTP 2-2-704
- o. Traction Devices: MTP 2-2-706
- p. Tracks and Suspensions: MTP 2-2-705
- q. Amphibious Vehicles: MTP 2-2-501
- r. Gun Control Systems for Vehicle Mounted Weapons: MTP 3-2-603
- s. Field Artillery Fire Control Sights: MTP 3-2-709
- t. Stabilization Systems: MTP 3-2-602
- u. Broadband Radio Interference Tests: MTP 2-2-613

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- v. Boresight Tests: MTP 3-2-604
- w. Secondary Armament: MTP 2-2-526
- x. Vehicle Main Gun Firing Tests as conducted in:
 - 1) MTP 3-2-506 or
 - 2) MTP 3-2-605
- y. Night Performance: MTP 2-2-616
- z. Effects of Altitude on Automotive Engines: MTP 2-2-702
- aa. Fording: MTP 3-2-612
- ab. Durability Testing as conducted in:
 - 1) MTP 2-2-506 or
 - 2) MTP 2-2-507
- ac. Laboratory Testing of Vehicular Engines as conducted in:
 - 1) MTP 2-2-700 or
 - 2) MTP 2-2-720
- ad. Laboratory Tests of Power Train Components: MTP 2-2-703
- ae. Vehicle Vulnerability Tests as conducted in:
 - 1) MTP 2-2-617 or
 - 2) MTP 2-2-618
- af. Material Characteristics: MTP 10-2-500

6.4 DATA REDUCTION AND PRESENTATION

Data shall be evaluated as described in the various tests, as applicable, for both the foreign vehicles under test and its American equivalent.

The performance of all foreign vehicles shall be compared to its American equivalent, and where applicable, the reasons for the improved or deteriorated performance of the foreign vehicle shall be given.

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